June 12, 1856.

The LORD WROTTESLEY, President, in the Chair.

The following gentlemen were admitted into the Society :—

Sir John Fox Burgoyne, Bart.
Philip Henry Gosse, Esq.
Archibald Smith, Esq.

The following communications were read :—

I. "On the Construction of the Imperial Standard Pound, and its copies of Platinum; and on the comparison of the Imperial Standard Pound with the Kilogramme des Archives." By W. H. MILLER, M.A., F.R.S., Professor of Mineralogy in the University of Cambridge.—Part II. Received June 7, 1856.

(Abstract.)

The Quartz Weight

The hardness of quartz, its capability of taking a high polish, the absence of any hygroscopic properties, and its indestructibility at the ordinary temperature of the atmosphere by any chemical agent except hydrofluoric acid, are such valuable qualities in a substance used for the construction of weights, that Professor Steinheil adopted it as the material for a copy of the kilogramme. The only objection to the use of a weight made of quartz is, that on account of the large amount of air displaced, the barometer and thermometer must be observed with extreme care during its comparison with a weight made of any ordinary metal. The Committee commissioned Mr. Barrow to construct a weight of quartz sufficiently near to 7000 grs. to admit of readily deducing the pound from it. Its form is that of a cube of about 2·2 inches, having its edges and angles rounded.

Its apparent weight in air is intermediate between that of a pound of platinum and a pound of brass, approaching more nearly to the latter than to the former.

Six series of weighings in water gave for the absolute weights of water displaced by it at 18° C.—

	2639·831
	2639·809
	2639·838
	2639·825
	2639·819
	2639·814
Mean	2639·823

Whence $$\frac{\text{density quartz at } 18^\circ \text{ C.}}{\text{density water at } 18^\circ \text{ C.}} = 2{\cdot}652590.$$

Denoting the quartz weight by Q, and the new Imperial Standard Pound by I, the comparisons of Q with I in air, reduced to a vacuum, gave

	Grains.	No. of Obs.
$Q = I +$	2·36801	40
$Q = I +$	2·36871	40
$Q = I +$	2·36817	40
$Q = I +$	2·36782	40
$Q = I +$	2·36715	40
Mean $Q = I +$	2·36797	200

Secondary Standards.

Thirty secondary standards, of gun-metal protected by amalgam-gilding, were constructed by Mr. Barrow. The densities of these were determined by weighing them in air and in water, and their absolute weights by comparison either with I or with T+D.

Values of the densities at the freezing-point in terms of the maximum density of water, absolute weights in terms of I, and apparent weights, at Somerset House in air of the temperature

65·66 Fahrenheit, under the pressure of 29·75 inches of mercury at the freezing-point of water ($t = 18°{\cdot}7$ C., $b = 755^{mm}{\cdot}64$), or in air for which $10 + \log \Delta = 7{\cdot}07835$, in terms of the commercial pound W of the same density as the lost standard troy pound.

No.	Density.	Absolute values.	Commercial values.
		grain.	grain.
1	8·3613	I−0·00732	W+0·01963
2	8·3416	I−0·03582	W−0·01135
3	8·3046	I+0·00510	W+0·02510
4	8·3650	I+0 00425	W+0·03154
5	8·0612	I+0·01783	W+0·00730
6	8·2878	I−0·01714	W+0·00080
7	8·1216	I+0·01933	W+0·01654
8	8·1632	I+0·01428	W+0·01679
9	7·3761	I+0·11611	W+0·00422
10	8·2838	I−0·03910	W−0·02165
11	8·3630	I−0·04208	W−0·01503
12	8·3192	I−0·02060	W+0·00115
13	8·4318	I−0·03331	W+0·00191
14	8·3496	I−0·02844	W−0·00301
15	8·3611	I−0·02022	W+0·00667
16	8·0735	I−0·02747	W−0·03640
17*a*	8·1172	I−0·02614	W−0·02948
17*b*	8·5589	I−0·04428	W+0·00542
18	8·3037	I−0·00129	W+0·01857
19	8·3397	I−0·01473	W+0·00950
21	7·9737	I+0·03971	W+0·01777
22	8·1986	I−0·01214	W−0·00523
23	8·1514	I+0·01557	W+0·01655
24	8·1429	I−0·03932	W−0·03941
25	8·1016	I+0·00180	W−0·00354
26	8·1522	I−0·00112	W−0·00001
27	8·1619	I+0·01405	W+0·01635
28	8·1260	I−0·00416	W−0·00638
29	8·1845	I−0·00222	W+0·00293
30	8·1529	I−0·00170	W−0·00050

II. "On the Determination of Unknown Functions which are involved under Definite Integrals." By J. Gomes de Souza, Professor of Mathematics in the Military Academy of Rio Janeiro. Communicated by Professor Stokes, Sec. R.S.

The author, after referring to a previous memoir on the same subject, presented by him to the French Academy, proposes to himself